Urban Wind

Hastings bridge waiting room blown over by wind

1910?
Toronto

• Has many “overlooked” aspects of the urban atmosphere
  – Wind
  – Heat
Wind

- Toronto has no single prevailing wind
- It shifts seasonally
- In classic winter weather
  - Dry, cold wind from the NW
- In classic summer weather
  - Warm, moist winds from the SW
- Strongest winds:
  - Winter easterlies
• The Venturi effect
The Venturi Effect

• Buildings disrupt winds close to the ground
  – Act as windbreaks in some places
• Funnel the wind through gaps
  – At increased velocities
  – The Venturi effect
• Urban Canyons
  – Zones between buildings where wind velocities increase
Toronto

- Basic street grid is 17 degrees west of True North
- NW and SW winds tend to create major wind canyons on North-South streets
- Probably worse in winter
  - Winds stronger, more closely aligned with streets
Victorian Wind Canyons

- Toronto’s unpaved clay-based streets had dust problems in summer
- Always seemed worst on north-south streets
- North-south streets ice first in cold, wet weather
- Queen-Bay always a windy corner
Edwardian Toronto

• Acquires tall skyscrapers
• Wind canyons develop around them
  – Queen-Richmond
  – King-Yonge
  – King-Bay
King-Yonge

• Develops the tallest buildings in Toronto pre 1920
• Becomes notoriously windy, even in light winds
  – Pedestrians, bicycles blown over
  – Enough to kill
Shelter

- Toronto’s buildings create shelter from the wind
  - As well as generating wind canyon conditions
- Some of the North-South dead end streets accumulate litter blown in from windy East-West streets
  - James St, Albert St, Toronto St
1910s-1920s

- Major phase of downtown redevelopment
- Skyscrapers move west to King-Bay, University
  - Wind canyon issues move with them
The Toronto Skyline
and
Seaman-Kent Hardwood Flooring

Back in 1901 when Toronto’s Skyline “From the Bay” revealed only two buildings of 10 storeys or more... In the rapidly altering skyline of Toronto we have had our share.
1960s onwards

• Skyscrapers a major part of 1960s downtown redevelopment
• TD Centre, Commerce Court
• Massive slab-like international style buildings with open plazas
• New City Hall
  – Designed in a wind tunnel
New City Hall

• Wind tunnel tests show the building will stand up to the wind
  – But no thought given to pedestrians
• Nathan Philips Square becomes notoriously windswept
  – Windiness a crucial argument in saving old city hall from demolition
TD centre

• The plaza becomes notoriously windy
• Climbing ropes have to be rigged to help people get up the stairs
  – Eventually replaced with railings
• TD centre creaks and sways in the breeze
Commerce Court

- Tried to create a sheltered plaza
- Commerce Court sways in the breeze
- Office workers get seasick in high winds
1970s Reform Council

- Led by the “Tiny Perfect Mayor” David Crombie
- Expressed its opposition to further downtown high-rise development by speaking about
  - “Windswept asphalt canyons”
Suburban Winds

• For Toronto’s print media “windswept” and “desolate” were indispensable in articles about York University 1970s onwards

• It was wise to convocate in June
York U 1985

• "a half-completed campus where a lot of wind whistles almost constantly through sparsely-spaced buildings …. a struggling, crowded, windswept but still human institution"

– Jack Cahill, Toronto Star, 1985
President Harry Arthurs

- Presided (1985-92) over ambitious Campus reconstruction
- Arthurs hoped to erase the idea of “Windswept York”
- But his reconstruction chief (Dr Philip Lapp) still described Campus as a “windswept wasteland” in 1986
1970s Wind Issues

• Routine windiness of the downtown core a powerful argument for the creation of the PATH underground walkway system
  – TTC subway otherwise likely to be overwhelmed by the large crowds

• Planners and public begin to recognize that tall buildings increase winds
26 Jan 1978

- Strong winter winds (126 kmh SW) reach almost hurricane force in Toronto’s downtown (161 kmh gusts)
- Pedestrians blown off their feet in the downtown wind canyons, hundreds injured
- Windows blown out on City Hall, Scotiabank, Commerce Court, TD Centre loses 20 windows
Bay & Bloor 26 Jan 1978
• Woman blown over at Bay & King, 26 Jan 1978
• Holding onto poles outside Union Station, Apr 1979
Windswept: Pedestrians at one of Metro's windiest corners, Bay and King Sts., were all but swept away by yesterday's gusts. More of the same was predicted for today.
Bay St battle: It took two to travel on Bay St. during yesterday's blasts of wind. Jean Lynch (left) and Darcey Palmer join hands to keep from being blown off their feet. But Metro's woes were just an inconvenience compared with the situation in the Maritimes and Britain.

Savage winds sweep through Metro
• Walking backwards on Bay St, Jan 1982
18 June 1982

• Mayor Art Eggleton opens a jogging track built around the podium of New City Hall
• Presented as a health & fitness initiative
• Track is wooden, held down by its own weight
28 Dec 1982

• The first time that the winds reach 111 kmh since the jogging track was built
• A large section of the jogging track is blown off the podium
  – While a family of 4 is standing on it
  – All 4 severely injured, father is paralysed
  – Family sues the city for $3.5 million, city pays
High winds blow family of 4 18 feet off deck at City Hall.

Four members of a family were injured yesterday when high winds blew them and the joggiing track they were walking on off a City Hall deck and 18 feet to the ground.

Police said the couple and their two sons, who were visiting from St. Marys, Ont., near Stratford, were found buried under large sections of the track, which sits on the elevated deck that rings the twin City Hall towers.

Injured were Joseph Ropp, 37, his wife, Cheryl, 34, and the couple’s two sons, Curtis, 9, and Jaden, 7.

Fierce gusts

Mr. Ropp is in serious condition at Toronto General Hospital with a broken neck, broken right leg and internal injuries. Mrs. Ropp is at the same hospital and in fair condition with a broken left leg and back injuries.

Curtis is in fair condition and Jaden is in critical condition at the Hospital for Sick Children. Curtis has a broken left arm while Jaden has head and internal injuries.

And two people were killed near Unionville in a storm-related accident after a power failure knocked out traffic lights at a busy intersection. But the City Hall incident was the most serious in Metro.

“All it took was one huge gust of wind and the track and the railing just flew right up,” said Paul Emery, director of Metro works department, who saw the accident at City Hall at 6:10 p.m.

“I could see it silhouette in the sky. It stayed in the air for a second and then came crashing down. I was lucky it didn’t hit me. I was just 50 feet away,” he said.

Police said Mr. Ropp and Jaden landed on concrete when they were blown off the track, while Mrs. Ropp and Curtis had their falls cushioned when they landed.
Probe demanded into fall of City Hall track

By John Ferri and Matt Mayeur

Toronto Star

Toronto politicians are clamoring for a full-scale investigation of a bizarre City Hall roof-top accident that could leave a young father paralyzed.

Joseph Ropp, 37, suffered an injury to his spinal column, and his wife and two sons had been broken when high winds blew them, and the logging track they were walking on, off a City Hall deck and 15 feet to the ground Tuesday.

"He has a spinal cord injury and was completely unable to walk or feel anything below his neck," said Dr. Paul Jackson, surgeon at Toronto General Hospital.

Doctors still don't know if Ropp, a Bell Canada technician in 30 years, will suffer any long-term paralysis. They added they expect his condition, described as "seriously but stable," to improve.

Setting example

"Someone is to blame for this particular incident and I want to know who," Alderman Tom Jago, of Ward 2, said yesterday. "City Hall should be the safest place in the city of Toronto. We should be setting an example for development across the city."

As the rest of the track was dismantled by workers yesterday, Julian said he was "appalled". City Hall was the scene of Toronto's only serious accidental during Thursday's storm.

Some lawmakers said it was too bad the wind had hit at night, as it had yesterday (Tuesday) and that it didn't happen every day, but they do happen two or three times a year.

Any investigation must address one fundamental question: Why was the track not anchored to the City Hall roof?

Before the City Hall track was installed, officials were discussing the safety of others across the city, including one on top of the 18-storey Richardson Building in the Willowdale Centre.

Owned and operated by the Cambridge Club, the Willowdale Centre is anchored into the concrete roof with metal studs. Owner Jim Bentley said the 10-year-old track has never been damaged by high winds.

In an interview, city property commissioner Graham Emms said designers felt the weight of the City Hall track — it takes eight men to lift an 8-by-8-foot section — would keep it in place.

"To the best of my knowledge no one ever considered anchoring it," he said. "It was felt that with the weight and configuration of the thing nothing could go wrong."

"It was a very close call but it is also suffering from broken ribs, a punctured lung in a fractured ankle.

Cheryl Ropp, 34, is in fair condition in Toronto General, with a broken leg and back injuries. Hospital staff said in fact yesterday, she is "understandably upset" and did not want to speak with reporters. A police spokesman said she was interviewed by the injured family.

Nine-year-old Kurtis, with a broken arm, and Jaden, 7, with head and internal injuries, are in serious condition across the street in the hospital for Sick Children.

News of the accident shocked many of the 4,531 residents of St. Marys, the Ropp family's home in Stratford.

Charles John, Mr. Ropp's father, said he couldn't sleep after he heard about the incident and spent much of yesterday trying to contact other relatives.

He said his family, stopping for a day in Toronto on their way to Ottawa, had travelled to Nathan Phillips Square to see the skating rink on the outside ring.

"Fracky isn't the word," said Barbara King, a technician in the city's department of St. Marys Memorial Hospital where Cheryl Ropp works three days a week. "I think you could have knocked us over with a feather this morning when we heard. Everybody knows them. It's a really close-knit community here."

Mr. Ropp repairs switching equipment in Bell Canada's central office in St. Marys. "He's a fine guy. He's worked for us for several years," said foreman Robie Robertson, who was signet to read of the accident in his morning newspaper.

Jaden and Kurtis' classmates at Central Public School in St. Marys will send their first day back from holidays Monday — writing get well cards if the pair remain in hospital, said principal Joyce DeLage.

Mrs. Ropp and Kurtis had their falls cushioned when they fell on soft ground, police said yesterday. They found Mr. Ropp and Jaden buried below large sections of the heavy wooded track, which sits on the elevated deck that runs the height of City Hall.

Toronto Mayor Art Eggleton and other officials had the rest of the 400-metre track removed yesterday as a precaution. Donated last June by the Sun Life Assurance Co., the track will be stored until spring when it is repainted.

Despite repeated patch-up jobs, the deck roof has been leaking for more than a decade, causing minor damage to the office below it. Last month a slab of concrete weighing about 10 pounds fell from the ceiling in the second-floor provincial land registry office.

The slab was dislodged while workmen were cleaning old waterproofing from the roof. No one was injured.
Wind and Planning

• New City Hall designed in a wind tunnel
  – But effect on pedestrians overlooked
  – Gap between the towers rips out windows, jogging tracks

• First efforts to recognize wind issues in a 1974 planning document
  – Did not lead to policy
Wind and Planning

• Special report on wind issues included in the CityPlan91 process in 1990

• But wind tunnel testing focussed on the likely areas of active redevelopment at the time
  – Established downtown wind canyons were not evaluated

• Dangerous wind conditions identified on Bloor St
Wind on Bloor Street, based on a wind tunnel study. Dark shading indicates areas uncomfortable for any pedestrian activity (from J. Jung, City Planning, 1985).

Ted Relph 1990
Wind and Planning

• Redevelopment of the Lower Donlands has been studied in a wind tunnel
• But no comprehensive policy yet to include wind issues in urban planning
• Yet Toronto’s wind canyons have been at the deadly threshold for a century
  – And are spreading
Present Condo Boom

• 190 high rises new and under construction in Toronto

• Present generation of condo high-rises typically feature green tempered-glass building envelopes
  – Prone to shatter from heat stress
  – Fragile in windy weather

• Wind is very much a contemporary urban problem